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(54) ROTARY LAPPING DEVICE FOR APPLYING COVER MATERIAL AROUND A LONGITUDINALLY MOVEABLE ELONGATE MEMBER

(71) We, SIEMENS AKTIENGESELLSCHAFT, a German company, of Berlin and Munich, Federal Republic of Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a lapping device for use in applying elongate cover material around an elongate member as the latter moves longitudinally relative to the device.

In order to be able to monitor satisfactory operation of lapping devices with the aid of which tape-form (band-form) or filamentary covering material is applied on an elongate material, it is conventional to so monitor the run-off of the covering material that, in the event of the latter tearing, an alarm device or a triggering device for stopping the covering procedure is actuated. Such devices having means for monitoring the run-off of the covering material are known above all in connection with the manufacture of electrical cables, i.e. for example for the covering of electrical conductors, cores or groups of cores (German Specifications Nos. 820 176 and 857 977, German Auslegeschrift No. 1 041 556).

A filament lapping device having means for monitoring filament rupture is known, by which the hitherto known monitoring devices operating with mechanically actuated contacts are improved. In the case of this device, there is rigidly connected with a filament spool an element co-operating in contactless fashion with an element arranged on a flyer. With this arrangement, the speeds, which vary in the normal operating condition, of the filament spool and of the flyer (coupled with each other via a slip brake) are compared with each other and evaluated. For example, there is rigidly connected with the filament spool a gearwheel disposed opposite which is a permanent magnet system arranged on the flyer (German Auslegeschrift No. 1 11 73). Such a monitoring device cannot yet be considered to constitute an optimum solution of the problem concerned, since for operation of this monitoring device it is necessary to have slip rings for electrically coupling the monitoring element connected with the flyer to the evaluating device, and since this monitoring element represents an unbalance which can only be equalised by corresponding counter-weights. In particular at high speeds, such measures must be considered to be disadvantageous due to the centrifugal forces occurring with them.

According to the invention there is provided a rotary lapping device for use in applying elongate cover material around an elongate member as the latter moves longitudinally relative to the lapping device; comprising a rotary carrier member for said cover material; a rotary flyer for unreeling cover material from said carrier; and a monitoring arrangement for monitoring the operation of the lapping device by evaluating and comparing the speeds of rotation of the carrier member and the flyer; in which the monitoring arrangement comprises a first monitor element coupled with the flyer for rotation therewith, a second monitor element coupled with the carrier member for rotation therewith, and third and fourth monitor elements fixed in the device and co-operable with said first and second monitor elements respectively for generating signals dependent on the speeds of the flyer and the carrier member.

Thus, apart from the first and second monitor elements, the remaining parts of the monitoring arrangement may be mechanically separate from the lapping device and, thereby, such parts will not exert any adverse mechanical loading on the carrier member and the flyer member. This is particularly advantageous when high speeds of rotation of the lapping deviec are contemplated.

The third and fourth monitor elements, which are fixed in the device, are mechanically completely separated from the rotating parts of the rotary lapping device, and coupling between the first and second monitor elements and the third and fourth monitor elements respectively is effected via air gaps, whereby the monitoring device proper can be stationary. This permits a simple construction of the rotary lapping device, in that the

first and second monitor elements thereof can be of symmetrical construction thereby permitting satisfactory high speed operation.

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:—

Figure 1 is a diagrammatic illustration of a lapping device according to the invention, a monitor arrangement for the device being shown by way of a block circuit diagram; and

Figure 2 is an enlarged view illustrating the features of the lapping device in more detail.

Referring now to the drawings, there is shown a rotary lapping device for use in applying elongate cover material around an elongate member as the later moves longitudinally relative to the lapping device.

Figure 1 shows a rotary lapping device 10 with which a filamentary covering or spinning material 22 is "spun" (wrapped) onto an elongate article in the form of a basic bundle or bunch 1 of a communication cable. The lapping device, which is mounted for rotation on a guide tube 28, comprises members 11 and 12 forming a rotary flyer (see Figure 2) and connected with a drive wheel 14 for unreeling the material 22, and also a covering material carrier member 20 on which the covering material supply 21 is arranged and connected via a shaft with a gearwheel 26. The covering material carrier 20 and the member 11 are connected with each other via a slip brake (not shown), for example via a hysteresis brake or a slip clutch. Since, due to the lapping process, covering material is continuously drawn-off from the covering material supply 21, under normal operating conditions of the lapping device there are different speeds between the member 11 (covering material) and the covering material carrier 20 and therefore between the drive wheel 14 (first monitor element) associated with the flyer (11, 12) and the gear wheel 26 (second monitor element) associated with the covering material carrier 20. The wheels 14 and 26 constitute circular monitor elements which are concentric, and rotatable with the respective members 11 and 20 about a common axis, and form part of a monitor arrangement for the lapping device.

Both wheels are designated as gearwheels having radially extending teeth, are made from a magnetic material (for example steel), and co-operate with monitor elements 31 and 32 fixed in the lapping device and arranged radially outwardly of the gearwheels. The monitor elements 31 and 32 comprise permanent magnets coupled with magneto-electric elements. Due to the teeth of the gearwheels 14 and 26 travelling past the monitor elements 31 and 32, the magnetic flux in the permanent magnets of the monitor elements 31 and 32 is continuously varied pulse-wise so that the latter transmit electrical pulse sequences to correspond to the number of teeth of the gear wheels 14 and 26 and to correspond to the velocity of the gearwheels. The pulses of these pulse-sequences are counted in counters 33 and 34, connected sequentially of which are signalling devices 35 and 36. As a function of the particular arrangement of the circuit, after a predetermined number of pulses, the signalling devices each transmit a signal to an AND gate 37 in which the two signals are compared with each other. During this comparison, via the signalling device 36 account is taken of the fact that there may be a phase shift of up to one tooth width between the two gearwheels 14 and 26 functioning as signal generators. Correspondence between the signals supplied by the two signalling devices 35 and 36 signifies that the flyer (11, 12) and the covering material carrier 20 are rotating at the same speed, i.e. that the lapping device is not working properly. In this case, there is supplied from the gate 37 to a timing element 38 a signal which is prolonged in the latter so as then to be able to trigger a relay or a contactor (magnetic switch) with which the lapping process is interrupted or an optical or acoustic signal device is triggered. In the normal case (when the flyer and the carrier 20 rotate at different speeds), the signals supplied by the signalling devices 35 and 36 will not correspond, so that no signal will be transmitted from the gate 37 to the timing element 38.

Monitoring is effected continuously with a cadence determined by the dimensioning of the signalling devices 35 and 36. After storage of a predetermined number of pulses in the counters 33 and 34, the counters are reset to zero via the timing element 38, the timing element simultaneously effecting delaying of resetting so as to effect resetting only after comparison in the gate 37 of the signals supplied by the signalling devices 35 and 36.

Figure 2 shows the construction of the lapping device 10 in more detail. The device comprises first of all, the pot-like member 11 carrying the cage-shaped member 12 and arranged on the hollow shaft 13. Connected with the hollow shaft 13 is the drive wheel 14—this is a gearwheel. Connected furthermore with the flyer (formed by members 11 and 12) is the ring 15 in which is arranged the permanent magnet 16 of a hysteresis brake. The permanent magnet cooperates with a disc 25 made of magnetic material and secured to the covering material carrier 20. Arranged on the covering material carrier is the covering material supply 21 from which the filament 22 is unreeled via the member 12. The covering material car-

rier 20 is secured on the hollow shaft 23 carrying the gearwheel 26 at its end remote from the covering material supply. This gearwheel is arranged adjacent the drive wheel 14 of the lapping device.

The hollow shaft 13 of the member 11 is mounted, via the two bearings 24 and 24¹ on the hollow shaft 23 of the covering material carrier. The hollow shaft 23 is mounted, with the aid of the two bearings 27 and 27¹, on the guide tube 28 (through which the elongate material (e.g. an electrical cable(s) to be covered is guided).

The gearwheel 26 (second monitor element) serves exclusively as a signal generator in co-operation with the (fourth) monitor element 31 arranged in a stationary monitoring device 30 which controls the operation of the lapping device. The drive wheel 14 (first monitor element) serves simultaneously as signal generator, in co-operation with the (third) monitor element 32 also arranged in the monitoring device 30.

While the third and fourth monitor elements 32 and 31 have been described above as comprising magneto-electric transducers, they may comprise photo-electric transducers when the first and second monitor elements comprise perforated or toothed discs, the first and second elements preferably having the same number of perforations, or teeth.

WHAT WE CLAIM IS:—

1. A rotary lapping device for use in applying elongate cover material around an elongate member as the latter moves longitudinally relative to the lapping device; comprising a rotary carrier member for said cover material; a rotary flyer for unreeling cover material from said carrier; and a monitoring arrangement for monitoring the operation of the lapping device by evaluating and comparing the speeds of rotation of the carrier member and the flyer; in which the monitoring arrangement comprises a first monitor element coupled with the flyer for rotation therewith, a second monitor element coupled with the carrier member for rotation therewith, and third and fourth monitor elements fixed in the device and co-operable with said first and second monitor elements respectively for generating signals dependent on the speeds of the flyer and the carrier member.

2. A device according to claim 1, in which said first and second monitor elements are circular and are arranged concentrically with respect to an axis about which the carrier member and the flyer are rotatable.

3. A device according to claim 2, in which each of the flyer and the carrier member is arranged in a respective hollow shaft carrying at its end a respective one of said first and second monitor elements.

4. A device according to claim 3, in which the hollow shaft associated with the flyer is mounted on the hollow shaft associated with the carrier member.

5. A device according to any one of claims 2 to 4, in which the first and second monitor elements comprise perforated or toothed discs, and said third and fourth monitor elements comprise photo-electric transducers.

6. A device according to any one of claims 2 to 4, in which the first and second monitor elements comprise gear wheels made from magnetic material, and the third and fourth monitor elements comprise magneto-electrical transducers.

7. A device according to claim 6, in which the teeth of the gear wheels are radially extending teeth.

8. A device according to claim 6 or 7, in which the gear wheel forming said first monitor element serves simultaneously as a drive wheel for the lapping device.

9. A device according to any one of claims 5 to 8, in which first and second monitor elements are arranged juxtaposed in the axial direction of the lapping device.

10. A device according to any one of claims 5 to 9, in which the first and second monitor elements have the same number of perforations, or the same number of teeth.

11. A device according to any one of the preceding claims, in which the third and fourth monitor elements are connected to an electronic evaluation device for comparing the electrical signals supplied thereto by the third and fourth monitor elements.

12. A device according to any one of the preceding claims, in which the monitoring arrangement includes means for controlling the operation of the lagging device.

13. A device according to any one of the preceding claims, in which the monitoring arrangement is responsive to effect termination of operation of the device when the instantaneous speeds of the flyer and the carrier member are substantially equal.

14. A device according to any one of the preceding claims, in which the carrier member is coupled with the flyer by means of a slip brake.

15. A device according to claim 1 and substantially as hereinbefore described with reference to, and as shown in the accompanying drawings.

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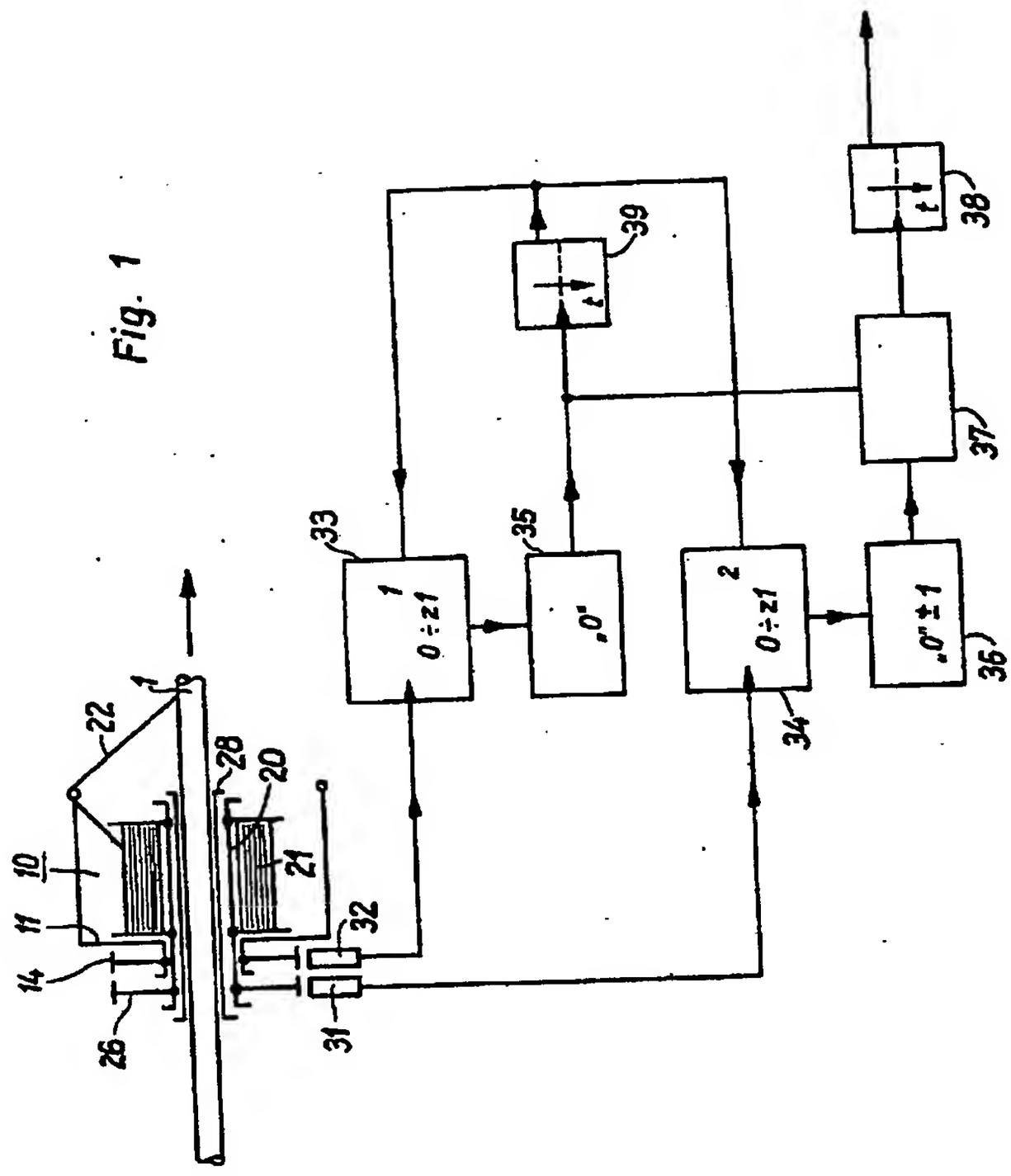
Sheet 1

Fig. 1



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2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 2

Fig. 2